

1 STATOR

2

3 Related Art

4

5 The invention is based on a stator according to the definition of the species in
6 Claim 1.

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8 A stator has already been made known in US-PS 5,089,730, onto the stator pole
9 teeth of which a preassembled coil is slid. The coils are secured to the stator pole
10 teeth by means of a single part.

11

12 This has the disadvantage, however, that a magnetic flux in the winding head of
13 the exciting coil cannot be directed in defined fashion, and therefore does not
14 contribute to the torque of the rotor, nor is there a gap in the foot of the tooth.

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16 Advantages of the Invention

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18 In contrast, the stator according to the invention having the characterizing
19 features in Claim 1 has the advantage that a stator can be produced in simple
20 fashion that makes smaller tolerances possible and has improved performance
21 data, such as a higher slot fill factor of the excitation coils, less space required to
22 install the motor, reduced stop torques, and higher torque, for example.

23

24 Advantageous further developments and improvements of the stator named in
25 Claim 1 are possible due to the measures listed in the dependent claims.

26

27 It is advantageous that a pole shoe is made of magnetically soft solid material,
28 because a magnetic stray flux of a winding head of an exciting coil can then be
29 directed in all spacial directions in defined fashion and contribute to the magnetic
30 excitation.

31

- 1 It is further advantageous that a coil insulating frame is located on the pole shoe,
- 2 because a coil can then be wound in simple fashion.

3

4 A coil can be electrically connected to an external power source or electrical
5 control in advantageous fashion if an electrical connecting element is integrated
6 in the coil insulating frame.

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Brief Description of the Drawing

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10 Simplified versions of the exemplary embodiments of the invention are shown in
11 the drawing and described in greater detail in the subsequent description.

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13 Figure 1 shows a first exemplary embodiment of a stator designed according to
14 the invention,

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Figure 2. Losses on elongation.

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17 Figure 4 shows an oblong pole shoe

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10 Detailed Description of the Exemplary Embodiment

20

Detailed Description of the Exemplary Embodiments

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21 Figure 1 shows a stator 1, according to the invention, of an electrical machine,
22 such as an internal rotor motor, for example. The stator 1 is formed by a stator
23 ring 3 that comprises at least one stator pole tooth 7 and a centerline 2. The
24 stator ring 3 is made of a solid material, or it is laminated. The, e.g., six stator
25 pole teeth 7 present, extending radially inward, are distributed evenly around the
26 centerline 2.

27

28 A coil 11 is slid onto each stator pole tooth 7. These are preassembled coils 11,
29 for example, e.g., "stoved-enamel" coils, or they are coils 11 wound onto a coil
30 frame 28. The coils 11 can also be compound coils.

1 Each coil 11 is secured to the stator pole tooth 7 by means of one pole shoe 15.
2 Each exposed end of a stator pole tooth 7 and each pole shoe 15 is designed in
3 such a fashion, for example, that a press fit is produced when joined. Any other
4 type of mounting is feasible.

5
6 A stator 1 is achieved as a result, the inner diameter of which has a maximum
7 tolerance of 0.05 mm between opposite pole shoes 15.

8
9 During assembly, the pole shoes 15 are placed on the stator pole teeth 7 and
10 fixed sufficiently on the stator pole teeth 7 using a mandrel inserted in the
11 direction of the centerline 2, and centered in relation to the centerline 2.

12
13 Figure 2 shows a pole shoe 15.
14 The pole shoe 15 comprises a groove 18 on an exterior surface 17, by means of
15 which it is pressed onto the exposed end of the stator pole tooth 7, so that a
16 press fit is produced. Magnetically soft material—"SMC" or "SMS" material—can
17 be used as the material for the pole shoe 15 that is easy to manufacture and
18 shape using pressing technology.

19
20 A stator according to the related art consists of stacks of individual laminations. It
21 requires considerable expenditure to manufacture a laminated pole shoe out of
22 individual laminations, however.

23
24 An opening angle α encompassing the length of the pole shoe 15 in the
25 circumferential direction around the centerline 2 can therefore be enlarged
26 compared with the related art, which makes a gap in the foot of the tooth 20
27 (Figure 1) smaller in size, and a stop torque for a transition between two detent
28 positions is therefore reduced, because magnetic resistance is reduced due to a
29 smaller gap in the foot of the tooth 20.

30
31 Figure 3 shows an oblong pole shoe 24.

1 The oblong pole shoe 24 is a pole shoe 15 that is longer in both axial directions
2 than an exemplary embodiment according to Figure 2, the groove 18 of which
3 oblong pole shoe 24 is closed on both ends by the extension and forms an
4 indentation 26.

5

6 Figure 4 shows an oblong pole shoe 24 on which the coil frame 28 is located.

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8 The coil frame 28 is integrally extruded on the oblong pole shoe 24 using plastic,
9 for example. Undercuts, for example, are provided in the pole shoe 15 or the
10 oblong pole shoe 24, i.e., a snap-in connection with the pole tooth 7 is formed, so
11 that the coil frame 28 is fixed in position on the pole tooth 7.

12

13 A coil 11 is wound on the coil frame 28 that can be inspected before installation
14 on the stator ring 3, i.e., only inspected coils 11 are installed. Therefore, a stator
15 1 that tests out poorly that comprises coils 11 wired together need not be thrown
16 out entirely due to one bad coil 1.

17

18 One part of the coil 11 (not shown) in a winding head space 23 is located on one
19 axial end of the coil frame 28. The oblong pole shoe 24 makes it possible to
20 direct a magnetic stray flux of an exciting coil 11 in defined fashion in the region
21 of the winding head space 23 of the coil 11 as well, and therefore also
22 contributes to the torque when a rotor is dimensioned accordingly.

23

24 The coil frame 28 also provides electrical insulation for the coil 11 from the pole
25 tooth 7 and/or the pole shoe 15 or the oblong pole shoe 24. The coil frame 28
26 comprises at least one electrical connecting element 34 that serves to contact at
27 least one end of a coil 11 with an external power supply. In this exemplary
28 embodiment, the electrical connecting elements 34 are formed by two pins 38
29 located in the coil frame 28. The electrical connecting element 34 can also be an
30 insulation displacement connection.

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